DOCUMENT RESUME

ED 222 280 PS 013 139

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TITLE The Effects of Exploration Training on Young Children's Associative Fluency.
PUB DATE Aug 82
NOTE 17p.; Paper presented at the Annual Meeting of the American Psychological Association (90th, Washington, DC, August 23-27, 1982).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Associative Learning; Cognitive Processes; Discovery Learning; *Discovery Processes; *Kindergarten Children; Preschool Education; *Questioning Techniques; Recall (Psychology); *Training Methods
IDENTIFIERS *Associative Fluency

ABSTRACT

Two experiments examined the effects of different models of exploration questioning on kindergarteners' associative fluency, or ability to verbalize novel uses for conventional stimuli. In the first experiment, five models of exploration questioning were compared for their ability to facilitate associative fluency with respect to an object previously explored. Results indicated that the most effective condition was one in which children were asked questions eliciting generally descriptive remarks along with questions designed to encourage statements about similarities and differences. In the next most effective condition, children answered exploration questions relating to either description or differences. In the second experiment, children's associative fluency was tested on objects not previously examined. Again, children performing best were exposed to exploration questions eliciting description and statements of similarity and difference. Children exposed to questions generating description and statements of differences did better than children exposed to questions relating to either description or differences alone. It was concluded that asking exploration questions eliciting descriptions or statements of differences was most facilitative of children's associative fluency. Such questioning models are seen as having classroom application. (Author/MP)

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ED222280

Paper presented at the Annual Meeting of the American Psychological Association
Washington,D.C., September,1982.

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The effects of exploration training on young children's associative fluency *

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Running Head: Exploration

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PS013139

*I would like to acknowledge Arlyn Hawley and Marilyn Mathis for their help with the data collection. I would like to thank Dr. Clyde Maxwell, Principal of the Oglethorpe County Elementary School, and the kindergarten teachers and children for their helpful cooperation. I would also like to thank the staff and children of the McPhaul Child Center, UGA, for their helpful cooperation.

Abstract

The effects of different models of exploration questioning on young children's associative fluency were examined in two experiments. The children in both experiments were kindergarteners. In Experiment 1 five models of exploration questioning were compared for their ability to facilitate associative fluency for an object previously explored. Results indicated that the most effective condition was one in which children were asked descriptive, similarity, and difference exploration questions about objects. The next most effective conditions had children answering either descriptive or difference exploration questions about objects. In Experiment 2 children's associative fluency was tested on objects not previously examined. Again, children exposed to descriptive, similarity, and difference exploration questions performed best. Children exposed to descriptive and difference exploration questions did better than children exposed to either descriptive or difference questions alone. It was concluded that asking descriptive and difference exploration questions were most facilitative of children's associative fluency. Such questioning models have classroom application.

The problem

The intent of the two studies presented here was to examine the effect of different forms of exploration questions on one aspect of children's creative behavior, associative fluency. Associative fluency is a measure of one's ability to verbalize novel uses for conventional stimuli (Wallach, 1970; Pellegrini & Greene, 1980). Associative fluency is typically measured by the alternate uses test (Wallach, 1970) which ask the subject to give alternate uses for conventional objects.

Related research

Research (Dansky & Silverman, 1973, 1975) has shown that young children's associative fluency with convention objects can be facilitated if they engage in free play with the objects. Dansky and Silverman, (1973) suggested that when children engage in free play with objects they explore objects' attributes, (e.g., their color, texture, and function) and form associations for these attributes. These associations for objects previously played with were hypothesized to be the bases for the creative uses given for the objects. For example, during play a child discovers a block's triangular shape. An association for this shape attribute may be a wedge of pie. Thus, an alternate use for this block may be a "make-believe" piece of pie.

In a subsequent study, Dansky and Silverman (1975) had children playing with specific objects for 10 minutes and asked them to give alternate uses for an object with which they had not previously played. In this transfer task children engaging in play with objects were again found to generate most alternate uses. The authors suggested that during play children established a "play set", or a playful disposition, towards interaction with objects. When these children were asked to give alternate

uses for objects not previously played with they transferred their playful dispositions to these objects and generated alternate uses. That is, children interacted with these new objects in such a way so that they extracted the objects' attributes and generated associations for these attributes during the criterion phase of the experiment.

Children's free play behaviors with objects have been described (Hutt, 1966) as being dominated by a "What is it?" and "What can I do with it?" disposition. Hutt (1966) differentiates play from exploration. Exploration behaviors with objects are dominated by "What is it?" and "What can it do?" dispositions. Exploration is a necessary, but not sufficient, condition for play. That is, children must familiarize themselves with objects, by covertly asking themselves "What is it? What can it do?", before they can play with objects. Children must be given an adequate amount of time to explore objects before they can begin to play with objects. Children in the Dansky and Silverman studies may have been engaging in spontaneous exploration, not spontaneous play, in that they were given ten minutes to "play" with objects.

In a recent series of studies Pellegrini (Pellegrini & Green, 1980; Pellegrini, 1981, 1982) suggested that young children's free play or free exploration of objects may be centered on a few of the objects' attributes during this short treatment time. He has shown that children can be trained to explore objects systematically within this same 10 minute period. The results of these experiments showed that this training method is a more effective facilitator of young children's associative fluency than spontaneous exploration or free play. Pellegrini's exploration training involved an experimenter engaging children in a questioning dialogue about objects. Children explore objects' attributes and functions by different types of exploration questions. They do not "play" with the

objects, in Hutts' (1966) sense of the word. Children are first asked descriptive exploration questions about objects, e.g., What do you see/ feel? Tell me about that. After children answer these questions for two objects they are asked difference and similarity exploration questions about the same two objects, e.g., How are they different? How are they the same?, respectively. This sequence of exploration questions has been shown to be a more effective facilitator of young children's associative fluency than free play with familiar (Pellegrini & Greene, 1980; Pellegrini, 1982) and unfamiliar (Pellegrini, 1981, 1982) objects. This series of questions can be used by teachers of children to stimulate children's cognitive and creative development (Sigel, 1979).

Experiment 1

The treatment conditions in Experiment 1 were designed to determine the effects on associative fluency of specific aspects of the exploration questioning model. The first condition in Experiment 1, the descriptive exploration condition, had an adult engaging children in dialogue with descriptive questions, i.e., What do you see/feel? Tell me about this. This condition had children exploring and verbally encoding objects' attributes. The second condition in this study was descriptive exploration and memory questions. Children in this condition answered the same descriptive exploration questions as children in Condition 1. After they answered descriptive questions about two objects, the experimenter asked children to tell him/her what they remembered about the first object they explored. The memory task served the function of determing the effect of placing a convergent task, i.e., memory for attributes, between children's descriptive explorations of objects and their performance of a divergent task, i.e., the alternate uses test. As a result, we could determine the

extent to which descriptive exploration and recall of the descriptors affected children's associative fluency.

Condition 3 was an exploration of the similarities between objects condition. It had an adult asking children similarity questions about two objects, i.e., How are they the same? Condition 4 was an exploration of differences between objects condition; children were asked difference questions about two objects, i.e., How are they different? These two conditions should provide insight into the extent to which training in explorations of differences and similarities affects children's associative fluency.

Condition 5 had children exposed to all of the above outlined questions in a set sequence of: descriptive, similarity, and difference exploration questions. This condition should help determine the extent to which the total sequence of exploration questions affects associative fluency. It was argued previously by Pellegrini (1982), that answering the total sequence of questions resulted in children forming analogic, or more abstract, concepts (Rumelhart & Abrahamson, 1973; Cocking & Sigel, 1979), of the objects they explored. If children have analogic concepts of objects they can draw upon the other objects in the categories that they placed the examined objects in for possible creative uses. In the present study, unlike previous Pellegrini studies (Pellegrini & Greene, 1980; Pellegrini, 1981, 1982) children were asked similarity exploration questions before difference questions. We did not want to put convergent exploration questions, noting similarities, before the divergent associative fluency task.

Research questions

The intent of Experiment 1 was to examine the extent to which different types of exploration questions affected children's associative fluency

for previously explored objects. The specific questions posed were: Is answering descriptive exploration questions a more effective facilitator of associative fluency than answering similarity and/or difference exploration questions. What is the effect of answering difference and similarity questions on children's associative fluency?

Method

Subjects. - The 60 children involved in Experiment 1 were drawn from a public kindergarten in the vicinity of Athens, Georgia. The sample was randomly drawn from a population of 100 children. The sample of 30 boys and 30 girls ranged in age from 63 to 72 months ($\bar{x}$ = 68.0; SD = 3.6). From this sample children were randomly assigned to one of six experimental groups: descriptive questions; descriptive questions and recall of attributes; similarity questions; difference questions; descriptive, similarity, and differences questions, control.

Materials. - The materials consisted of a wooden thread spool, a pipe cleaner, a wooden clothes pin, and a wine bottle cork. In all questioning conditions children were questioned about two of these objects. During the criterion phase they interacted with one familiar object, i.e., an object on which they were previously questioned.

Procedure. - All children were exposed to their respective treatments twice within a three day period. In all questioning conditions children were questioned on two stimulus objects. They were told they could handle the objects as they answered questions. Each treatment lasted about ten minutes.

In the descriptive exploration question treatment, Condition 1, individual children were given one object at a time and asked Tell me

something about this. What does it feel/look like? In the descriptive exploration and recall condition, Condition 2, individual children were asked the same series of descriptive questions. After they answered these questions they were asked to: Tell me all you remember about the _____. In both descriptive exploration conditions children answered questions about two objects.

In the similarity exploration question condition, Condition 3, children were presented with two objects and asked How are these two things the same? How else are they the same? In the difference exploration question condition, Condition 4, children were presented with two objects' and asked How are these two things different? How else are they different?

In the descriptive, similarity, and difference condition, Condition 4, children were asked each type of exploration question, as outlined above, in a specific order: descriptive, similarity, and then difference questions. Children in the control condition were engaged in conversation about their favorite school activities by an experimenter.

Children were questioned individually in a vacant room in their school by an experimenter. Experimenters, two female and one male, were randomly assigned to conditions.

The Dependent Measure. - Immediately following each of the second treatment and control sessions, each subject was given an alternate uses test by the same experimenter with whom they interacted in their assigned condition. Children were asked to give alternate uses for one familiar object, i.e., one of the two objects they interacted with in their respective conditions. Children in the control condition were given an alternate uses test on one stimulus object randomly selected from the total array of four stimulus objects.

In presenting each student with a stimulus object the experimenter, said, You can use this in lots of ways. Tell me how you can use it? What can you make with it? How can you play with it? No time limit was imposed on this part of the session. All subjects' utterances were audiotaped during the experimental sessions. Tapes were coded by the author on the same day on which they were recorded. Uses were coded as conventional when children suggested using the stimulus object in the following way(s): the cork to plug bottles, the clothes pin to hang things, the pipe cleaner to clean pipes, the thread spool for sewing. All other uses, i.e., alternate uses, were coded as creative. No differentiation was made within the class of creative responses. A second coder reexamined all uses given during the criterion phase. She also coded uses as creative or conventional. Interrater agreement on the coding of the creative uses for the objects was 99%.

Results and Discussion

Children exposed to the total exploration questioning paradigm generated the greatest number of creative responses to familiar objects (79). Children exposed to the descriptive exploration questions (49) generated more creative uses than children in difference exploration questions (44) group, descriptive exploration questions and recall (28) group and the control (28) group.

A one-way ANOVA was calculated to determine the effect of condition on the number of creative uses for familiar objects. Condition had a significant main effect, F (5,54) = 4.15, $p < .003$; R^2 was .277. Student's Newman-Keuls, preset at .10, indicated that children in the total exploration questioning group ($\bar{x}$ = 7.90) generated significantly more creative uses than children in all other groups. Children in the descriptive exploration questions group ($\bar{x}$ = 4.9) gave significantly more uses than children in the descriptive exploration and memory question ($\bar{x}$ = 2.8), similarity exploration questions ($\bar{x}$ = 3.7), and control ($\bar{x}$ = 2.8) groups. Children in the difference exploration questions group ($\bar{x}$ = 4.4) generated significantly more creative uses than children in control and descriptive and recall groups.

These results support the interpretation set forth by Pellegrini and Greene (1980) that children's ability to generate novel uses for objects they were previously questioned on seems to be a result of their answering exploration questions about objects. Associative fluency is most successfully facilitated when children answer descriptive, similarity, and difference questions about objects. The described aspects of the objects may be the bases for creative uses. Answering descriptive exploration and difference exploration questions both seem to be effective facilitators of associative fluency. Answering similarity exploration questions and descriptive

exploration questions and recalling attributes, were no more effective than the control condition. These data seem to indicate that both descriptive exploration and difference exploration questions facilitated associative fluency. To explore further the specific effects of these conditions a second experiment was designed.

Experiment 2

Experiment 1 indicated that asking children descriptive exploration questions and difference exploration questions facilitated associative fluency. In Experiment 2 we attempted to identify the effect of these conditions separately and in combination with each other on a transfer task. That is, in addition to the descriptive exploration questions alone, difference exploration questions alone, and descriptive, difference, and similarity exploration questions conditions, a group was asked both descriptive and difference exploration questions. Results from Experiment 2 should provide insight into the best facilitator of children's ability to generate alternate uses for an object not previously examined.

Research questions

The first research question posed in Experiment 2 was: To what extent were two types of exploration questions together, descriptive and difference, more effective than either of them alone? The second question posed in Experiment 2 was: Do children exposed to descriptive, similarity, and difference exploration questions perform better than children exposed to both descriptive and difference exploration questions?

Method

Subjects. - The 50 children in Experiment 2 were drawn from two kindergartens in and around Athens, Georgia. The sample of 25 boys and

and 25 girls ranged in age from 62 to 74 months ($\bar{x}$ = 68.4; SD = 3.6). Ten children were randomly assigned to one of five conditions: descriptive questions; difference questions; descriptive and difference questions; descriptive, similarity, and difference questions; or control.

Materials and procedure. - The materials were the same as described in Experiment 1. The procedure was the same as in Experiment 1 to the extent that children were exposed to two ten minute questioning sessions. The contents of each condition (the difference questions alone, descriptive questions alone, and descriptive, similarity and difference questions conditons) were identical to the content outlined for Experiment 1. A new condition was added to Experiment 2, a descriptive and difference exploration question condition. Thus, there were four treatment groups and a control group. The control group talked with the experimenter about their favorite school activities for ten minutes. There were two experimenters in Experiment 2, one male and one female. They were randomly assigned to condition.

The dependent measure. - Immediately following each treatment, children were given the alternate uses test for one object they had not been questioned on. The criterion phase of Experiment 2 followed the procedure outlined in Experiment 1. Objects were randomly chosen from the total array of four objects. The same criteria as outlined in Experiment 1 for creative uses for each of the objects were followed. The inter-rater agreement for creative uses was 99%.

Results and Discussion. - The results of Experiment 2 indicated that the children exposed to the total exploration questioning paradigm generated 64 creative uses for unfamiliar objects. Children answering only descriptive exploration questions gave 41 uses and children answering descriptive and difference exploration questions gave 55 uses. Children answering

difference exploration questions gave 31 uses and control children gave 13 uses.

A one-way ANOVA was calculated to determine the effect of condition on the ability to generate novel uses for unfamiliar objects. A significant effect for condition was detected, F (6,42) = 5.81, $p < .002$; R^2 was .453. Student's Newman-Keuls, pre-set at .10, indicated that the total questioning paradigm ($\bar{x}$ = 6.4) was significantly more effective than the descriptive and difference exploration questioning ($\bar{x}$ = 5.5) condition which was, in turn, significantly more effective than the descriptive exploration questioning condition ($\bar{x}$ = 4.1). The latter condition was significantly more effective than the difference exploration questioning ($\bar{x}$ = 3.1) condition which was, in turn, significantly more effective than the control group ($\bar{x}$ = 1.3).

These results replicate and extend previous work by Pellegrini (1981, 1982) indicating that children exposed to the total questioning paradigm are able to transfer the strategy to an unfamiliar object. The results from Experiment 2 further indicated that having children answer descriptive exploration and difference exploration questions was more effective than either of these strategies alone. The effectiveness of the former condition was due to its additive structure. That is, it combined two strategies which by themselves were facilitative of young children's associative fluency.

General Discussion/Conclusion

The two experiments reported here provide insight into methods facilitative of one aspect of children's creative behavior, associative fluency. In the first study children were asked to generate creative uses for objects they had previously examined in their respective exploration conditions. Results from this experiment indicated that neither answering descriptive exploration questions coupled with recalling objects' attributes nor

answering similarity exploration questions were facilitative of children's associative fluency. Two important exploration questions which did facilitate associative fluency were identified in Experiment 1: Answering descriptive exploration questions and answering difference exploration questions. Descriptive exploration questions allowed children to explore objects' attributes and generate associations for the attributes. For example, cylindical shape can be associated with a barrel. Difference exploration questions allowed children to put objects into many different categories; for example, a pipe cleaner is a member of the class of white objects and of soft objects. Children in this latter condition could have drawn upon objects from these new classes for possible creative uses. For example, a pipe cleaner could be used for a cigarette, because they are both members of the class of white objects.

Experiment 2 showed that children could transfer the descriptive and difference exploration strategies to objects not examined during treatments. These two conditions had an additive effect on the transfer task in Experiment 2: The combination of descriptive and difference exploration questions was more effective than either of the questioning strategies alone. These results are consistent with Vandenberg's (1980) hypothesis that both exploration (like our descriptive exploration) and divergent thinking (like our answering difference questions) are involved in associative fluency.

The most effective facilitator of associative fluency for both unfamiliar and familiar objects was the condition where children answered descriptive exploration questions then answered similarity and difference exploration questions. The similarity exploration questions probably enabled children to explore further each objects' attributes; for example, a spool and a cork are similar to the extent that both are cyclindical.

This aspect of the condition may have enabled children to explore attributes not explored while answering the descriptive exploration questions. The similarity exploration questions, then, may have functioned as an additional set of descriptive exploration questions.

Summary

The results of the two experiments indicated that young children's associative fluency could be facilitated by using two sets of exploration questions. The first set has children answering descriptive exploration questions and then answering similarity and difference exploration questions. The second set has children answering difference exploration questions. Teachers of young children can use these questioning techniques to stimulate children's flexible, or creative, thinking. Teachers can use these questions with individual children or groups of children.

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